

REMARKS

Claims 1-17 are currently pending in the present application. Claims 1 and 6 have been amended. Claims 1-11 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,434,056 issued to Keefer (Keefer).

Claims 12-17 are new. New claims 12-17 have an entirely hydraulic pressure-compensating device for use in a system for the continuous desalting of water. The pressure-compensating device includes a pre-charged hydraulic connecting line connecting pressure chambers and forming a closed fluid loop. The pre-charged hydraulic pressure from the connecting line provides hydraulic force to drive the pistons of the system.

With respect to claims 1-11, an analysis under § 103 requires that the Examiner explain why, after assessing the level of those skilled in the art, the skilled artisan would have found the claimed subject matter, as a whole, to have been obvious. To establish a *prima facie* case of obviousness, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to combine the references, and there must be a reasonable expectation of success. MPEP § 706.02(j). The suggestion or motivation to make the claimed combination and a reasonable expectation of success must both be found in the prior art. *Id.* The Examiner cannot rely on hindsight as the basis for combining two references. If the references do not expressly or impliedly suggest the combination, "the Examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." *Id.* (citing *Ex parte Clapp*, 227 U.S.P.Q. 972, 973 (Bd. Pat. App. & Inter. 1985)).

The present invention is directed toward a more efficient method and a simpler apparatus for desalting water. According to the invention, in addition to the intake chamber and the discharge chamber, each piston device includes a pressure chamber (23, 33, 43). These pressure chambers are connected by a single hydraulic connecting line 7, in order to enable pressure compensation between these three chambers and to ensure an identical pressure level p_3 in all three chambers. (see p. 3, lines 27-32) The pressure in these pressure chambers and the

connecting lined are preset, fixed and continuous, i.e. there are no inputs and outputs, it is a closed system. The hydraulic fluid (e.g. water) is provided under a high pressure when the device is manufactured. The pressure in the hydraulic connecting lines provides an additional force on a part in the rear of the piston (e.g. part 343 for the middle piston device 30) in order to assist the pressure that is exerted on the piston by the concentrated salt water introduced into the discharged chamber. It can be seen that no further pistons (See Keefer Ref. Nos. 205, 206, 207), no further connecting lines (See Keefer Ref. Nos. 242, 244, 247, 248, 249) and no crankshaft and crank pins or throws as in the device of Keefer are required.

Independent claim 6 is directed toward a reverse osmosis device for the continuous desalting of water, including, a membrane module for separating the water, a pressure-compensating device to continuously introduce the salt water at an increased pressure level into the membrane module, a feed pump to introduce salt water at a pressure level into the pressure-compensating device, and pistons. The pistons further include an intake chamber, a discharge chamber and a pressure chamber. The pressure chamber of the piston is hydraulically connected to the pressure chamber of other pistons by a single hydraulic connecting line so that during operation a continuous, preset, identical pressure can be exerted on a part of the piston. The piston pressure chamber assists the pressure that is exerted on the piston by the concentrated salt water that is introduced into the discharge chamber. Independent claim 1 is directed toward a method for desalting water.

In accordance with the specification, in the present invention the pressure chambers 23, 33, 43 together with the connection 7 are a closed system in which a certain pressure p_3 is provided. By use of this pressure in the pressure chamber, an opposing force f_G exists (see Fig. 2, pressure chamber 33) which is nearly as large as or slightly smaller than the force F acting on the piston 34 due to the pressure p_1 at which the salt water 10 flows into the intake chamber 31. Thus, moving the piston 34 up. Simultaneously, the piston 24 moves down so that salt water is pumped from the intake chamber 21 to the membrane module 3. Thus, the pressure p_3 supports pressure p_2 wherein salt water flowing out of the membrane module flows into the discharge chamber (in the situation shown in Fig. 2, into the discharge chamber 22), and thus leads to a higher efficiency of the whole system by effectively using the pressure p_2 under

which the concentrated salt water is flowing out of the membrane module. There are several advantages of the present invention, including, that the pump 1 used for pumping the salt water into the system can be smaller, will work at a lower pressure and is thus less expensive. All of these advantages are not available in Keefer.

Keefer does not teach or suggest pressure chambers hydraulically connected to each other such that, during operation, a continuous pressure can be exerted on a part of the piston to assist the pressure being exerted by the concentrated salt water. The Examiner states that Keefer does not specifically teach a using a separate feed pump (presumably to provide this continuous pressure). The Examiner, however, takes the position that it would be obvious to one of ordinary skill in the art at the time of invention that a separate feed pump may be used in the Keefer system if the pressure of the incoming feed at line 221 is inadequate. The applicant respectfully disagrees with the Examiner's conclusion and further notes that the mechanical construction of the apparatus of Keefer includes additional pistons, connecting lines, crank shafts, crank pins and throws not needed by the desalting device of the present invention, and that the addition of a separate feed pump would render these additional mechanical components inoperable for their intended purpose. There is no suggestion or motivation in Keefer to make the claimed combination to provide the instant invention. Providing Keefer with the pressure-compensating device (the closed system including hydraulic lines 7) of the present invention would be applying impermissible hindsight in order to render the current invention obvious.

With reference to Figure 1, Keefer teaches that salt water is pressed from chamber 185 (of the left piston device) through the valve 229 into the membrane module 165. The left line (having no reference) sign, but being numbered as line 240 in the description, connects the membrane module and chamber 210, thus allowing concentrated salt water to flow from the membrane module to the chamber 210. The piston 205 in this chamber 210 has the function of a valve slide or valve switch opening and closing the connecting line 247 between the chamber 210 and the chamber 201 of the middle piston device. In the situation shown in Figure 1, this connecting line 247 is closed by the piston 205. However, the chamber 210 is also connected with the neighboring chambers 211 and 212 by connecting lines 242 in the upper portion of the chamber exposed to the pressure of the salt water provided via line 240; and by connecting lines

244 in the pressure-less lower portion of the chamber, by which concentrated salt water is discharged (see reference sign 169).

Since the piston 205 is in an upward movement, the pressure provided via line 240 does not support this movement because any pressure provided by line 240 would serve to push the piston 205 down. This pressure is transported to these chambers via the connecting line 242 to the chambers 211 and 212. The piston 207 in the chamber 212 of the right piston device is in a downward movement, and a connecting line 249 from the chamber 212 to the chamber 198 (of the left piston device) is open, so that the pressure of the concentrated salt water provided via line 240 can be transported to this chamber 198. Therein, this pressure is exerted on the piston 196 and supports the upward movement of this piston, thus discharging the salt water present in the upper chamber 185 of this piston device into the membrane module 165. In addition, the relative relationship of the pump components is set by crank pins or throws 175, 176, 177 provided on a crank shaft 173 on which an additional force can be provided to move the pistons.

Although these inventions both strive to desalt water, the apparatus and method of the present invention is not taught, disclosed or made obvious by Keefer. Keefer does not teach a continuous, preset, identical pressure exerted on a part of the piston by means of a single hydraulic connecting line between the pressure chambers in a closed system as disclosed and claimed in the present invention. Further, Keefer does not provide any suggestion of modifying the desalting device to provide this system. Any such modification would only be apparent after understanding the present invention and applying impermissible hindsight analysis. The Examiner accordingly has not succeeded in bringing a *prima facie* case of obviousness in this instance. Therefore, independent claims 1 and 6 and the dependent claims thereof are patentable over Keefer under 35 U.S.C. § 103.

As discussed above, new claims 12-17 are directed toward an entirely hydraulic pressure-compensating device for use in a system for the continuous desalting of water.

The Director is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090.

Application No. 10/031,840
Reply to Office Action dated February 9, 2004

Applicant respectfully submits that all claims remaining in the application are now clearly allowable. Favorable consideration and a Notice of Allowance are earnestly solicited. Applicant's attorney wishes to express her willingness to engage in a telephone interview to further the status of this application if any further concerns need to be addressed.

Respectfully submitted,

SEED Intellectual Property Law Group PLLC



Susan D. Betcher
Registration No. 43,498

SDB:mt

Enclosure:
Postcard

701 Fifth Avenue, Suite 6300
Seattle, Washington 98104-7092
Phone: (206) 622-4900
Fax: (206) 682-6031

459392_1.DOC